What is claimed is:

1. A semiconductor laser element comprising

a substrate,

a plurality of semiconductor layers formed on the substrate, and

a concave portion formed on one surface of the substrate, said one surface being opposite to the other surface having the semiconductor layers formed thereon, wherein

the concave portion is filled with a metal having a heat conductivity higher than the substrate.

2. A semiconductor laser element comprising

a substrate,

a plurality of semiconductor layers formed on the substrate, and

a concave portion formed on at least a part of one surface of the semiconductor layer, said one surface being the surface further from the substrate, wherein

the concave portion is filled with a metal having a heat conductivity higher than the semiconductor layer.

3. The semiconductor laser element according to claim 2, wherein another concave portion is formed on one surface of the substrate, said one surface being opposite to the other surface having the semiconductor layers formed thereon, and wherein

said another concave portion is filled with a metal

having a heat conductivity higher than the substrate.

4. The semiconductor laser element according to any of claims 1 to 3, wherein the concave portion has a reverse mesa form in a direction vertical to a light-emitting face.

5. The semiconductor laser element according to any of claims 1 to 3, wherein a heatsink is connected to the metal filled in the concave portion.

6. The semiconductor laser element according to any of claims 1 to 3, wherein a plurality of light-emitting portions are formed on the semiconductor layer to form a semiconductor laser array.

7. The semiconductor laser element according to any of claims 1 to 3, wherein the semiconductor laser element is used as a light source for exciting a solid laser.

8. A semiconductor laser comprising

a semiconductor laser element,

a heatsink disposed in contact with the semiconductor laser element,

a cooling medium passageway formed between the heatsink and the semiconductor laser element, at least a part said heatsink and said semiconductor laser element working as the passageway wall, and

means for causing a cooling medium to flow through the cooling medium passageway.

9. The semiconductor laser according to claim 8, wherein

the heatsink includes a first heatsink disposed in contact with the substrate of the semiconductor laser element and a second heatsink disposed in contact with one surface of the semiconductor laser element, said one surface being opposite to the other surface where the substrate is formed, wherein

a first cooling medium passageway is formed between the first heatsink and the semiconductor laser element, and wherein

a second cooling medium passageway is formed between the second heatsink and the semiconductor laser element.

10. The semiconductor laser according to claim 8 or 9, wherein at least a part of the cooling medium passageways comprises a groove formed on the substrate of the semiconductor laser element.

11. The semiconductor laser according to claim 10 wherein the groove formed on the substrate has a reverse mesa form.

12. The semiconductor laser according to claim 8 or 9, wherein at least a part of the cooling medium passageways comprises a ridge groove formed on the surface of the semiconductor laser element opposite to the substrate.

13. The semiconductor laser according to claim 10, wherein wall portions of the groove formed on the semiconductor laser element are covered with a dielectric.

14. The semiconductor laser according to claim 8 or 9, wherein the heatsink has, a supply passageway connected to the cooling medium passageway for supplying a cooling medium to the passageway and/or a discharge passageway for discharging the cooling medium from the passageway.

15. The semiconductor laser according to claim 8 or 9, wherein the heatsink is connected to the semiconductor laser element using a brazing material which is resistant to the cooling medium.

16. The semiconductor laser according to claim 8 or 9, wherein a plurality of the semiconductor laser elements are formed to constitute a semiconductor laser array, and

the cooling medium passageways are arranged between the semiconductor laser elements and the heatsink.

17. The semiconductor laser according to claim 8 or 9, wherein the semiconductor laser element is used as a light source for exciting a solid laser.

18. A semiconductor laser element comprising

a GaN substrate equipped with one of a pair of electrodes,

a semiconductor layer made of a GaN-base semiconductor including at least an active layer, said semiconductor layer disposed on the GaN substrate, and

the other one of the pair of electrodes disposed on the semiconductor layer, and

an electric current injection region formed on the

semiconductor layer, wherein

a groove is formed on one surface of the GaN substrate at a region thereon corresponding to the electric current injecting region, said one surface being the surface further from the semiconductor layer, said groove reaching to the depth of the semiconductor layer, and wherein

said one of the pair of electrodes is formed on the surface of the groove.

19. The semiconductor laser element according to claim 18, wherein a contact layer is formed on the GaN substrate side of the semiconductor layer, and

wherein the contact layer is ohmic-connected to the electrode formed on the surface of the groove.

20. The semiconductor laser element according to claim 18 or 19, wherein the groove is filled with a metal having a heat conductivity higher than the GaN substrate,

wherein the surface having the groove is flattened, and wherein,

the heatsink is connected to the flattened surface.

21. The semiconductor laser element according to claim 20 wherein the metal is Au.

22. A semiconductor laser comprising

the semiconductor laser element according to claim 18 or 19,

a heatsink connected to the GaN substrate side of the semiconductor laser element, and having formed therein a

supply passageway for supplying a cooling medium to a groove and a discharge passageway for discharging the cooling medium from the groove, and

means for causing the cooling medium to flow to the groove through both the passageways.